1 (1 pt)
You are given an omnidirectional robot that moves on the 2D plane without friction. We can control the velocity of this robot. Write down a dynamics model that describes the motion of the robot. Can we apply LQR to this system?

2 (0.5 pt)
Write down a cost function that will stabilize the robot at state zero.

3 (0.5 pt)
Is the transition cost function $g(x, u) = x^T \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} x + u^T u$ valid for use in LQR control? Justify your answer.